AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

Claims 1-15 (canceled).

16. (currently amended): A method for detecting the concentration of exhaust gas using a NOx sensor having first and second measurement chambers including associated first and second oxygen ion pump cells, respectively, which detects the concentration of NOx in a gas discharged from an internal combustion engine, the method comprising:

detecting oxygen concentration in a gas introduced into the first measurement chamber of the NOx sensor based on an electric current flowing through the first oxygen ion pump cell of the NOx sensor;

calibrating a detection output of the gas sensor by determining a zero point, which indicates a zero concentration of NOx, based on a detection output of the NOx sensor when the detected oxygen concentration assumes a value substantially the same as that in atmosphere, and

determining the NOx concentration ~~of said specific component~~ after the detection output has been calibrated.

17. (previously presented): A method for detecting the concentration of exhaust gas using a gas sensor having first and second measurement chambers including associated first and second oxygen ion pump cells, respectively, which detects the NOx concentration in a gas discharged from an internal combustion engine, comprising:

detecting oxygen concentration in a gas introduced into the first measurement chamber of the NOx sensor based on an electric current flowing through the first oxygen ion pump cell of the NOx sensor;

calibrating a detection output of the NOx sensor by determining a zero point, which indicates a zero concentration of the NOx, based on a detection output of the gas sensor obtained on cutting fuel supply to said internal combustion engine for setting the NOx concentration in the gas introduced into said gas sensors substantially to zero or to substantially the same level as the atmosphere; and

determining the NOx concentration after the detection output has been calibrated.

18. (previously presented): A method for detecting the concentration of exhaust gases using a NOx sensor having first and second measurement chambers including associated first and second oxygen ion pump cells, respectively, which detects the NOx concentration in a gas discharged from an internal combustion engine, the method comprising:

detecting oxygen concentration in a gas introduced into the first measurement chamber of the NOx sensor based on an electric current flowing through the first oxygen ion pump cell of the NOx sensor;

calibrating a detection output of the gas sensor by determining a zero point, which indicates a zero concentration of the NOx, based on a detection output of the gas sensor obtained on setting a rich air-to-fuel ratio for said internal combustion engine to reduce the NOx and to set the NOx concentration in the gas introduced into said gas sensor substantially to zero or to substantially the same level as the atmosphere; and

determining the concentration of the NOx after the detection output has been calibrated.

19. (previously presented): The method as defined in claim 16, wherein said gas sensor is a NOx sensor.

20. (previously presented): The method as defined in claim 16,

wherein said NOx sensor has a first diffusion resistance unit and a second diffusion resistance unit;

wherein said exhaust gas is diffused via said first diffusion resistance unit into said first measurement chamber, said first oxygen ion pump cell pumping out oxygen from said first measurement chamber; and

wherein the gas having the specified oxygen concentration is diffused from said first measurement chamber via said second diffusion resistance unit into said second measurement chamber; NOx is decomposed in said second measurement chamber; said second oxygen ion pump cell pumping out dissociated oxygen ions; and the NOx concentration is detected from a current flowing in said second oxygen ion pump cell.

21. (canceled).

22. (previously presented): A method for detecting the concentration of exhaust gases using a gas sensor having first and second measurement chambers including associated first and second oxygen ion pump cells, respectively, which detects the NOx concentration in a gas discharged from an internal combustion engine, comprising:

operating the internal combustion engine under a driving condition in which the NOx concentration can be estimated or in which the NOx concentration is known;

detecting oxygen concentration in a gas introduced into the first measurement chamber of the NOx sensor based on an electric current flowing through the first oxygen ion pump cell of the NOx sensor;

calibrating a detection output of said NOx sensor based on a detection output of said NOx sensor when the detected oxygen concentration assumes a value substantially the same level as that in the atmosphere; and

determining the NOx concentration after the detection output has been calibrated.

23. (previously presented): An apparatus for detecting the NOx concentration of exhaust gases comprising:

a NOx sensor having first and second measurement chambers including associated first and second oxygen ion pump cells, respectively, for detecting the NOx concentration in a gas discharged from an internal combustion engine;

driving condition setting means for setting driving conditions for the engine which enable the NOx concentration to be estimated or which render said concentration known; and

calibration means for calibrating a detection output of said NOx sensor based on a detection output of said NOx sensor under said driving conditions as set by said driving condition setting means, said detection output being calibrated when an oxygen concentration of a gas introduced into the first measurement chamber of the NOx sensor is substantially the same

as that in the atmosphere, said oxygen concentration being detected by a current flowing through the first oxygen ion pump cell of the NOx sensor.

Claims 24-56. (canceled)

57. (previously presented): A method for detecting the concentration of exhaust gas using a NOx sensor which detects the concentration of a specific component in a gas discharged from an internal combustion engine, the method comprising:

calibrating detection output of the gas sensor by determining a zero point, which indicates a zero concentration of said specific component, based on a detection output of the gas sensor in atmosphere, and

detecting the concentration of said specific component after the detection output has been calibrated,

wherein said NOx sensor is mounted downstream of a NOx occlusion catalyst and wherein said zero point is calibrated based on a detection output of said NOx sensor when an air-to-fuel ratio is temporarily set to a rich side for cleaning NOx occluded in said NOx occlusion catalyst.

58. (previously presented): A method for detecting the concentration of exhaust gas using a NOx sensor having a detection output which detects the concentration of a specific component in a gas discharged from an internal combustion engine, the method comprising:

detecting the concentration of the specific component in atmospheric air to obtain a zero point, which indicates a zero concentration of the specific component,

calibrating the detection output of the gas sensor based on said zero point, and

detecting the concentration of said specific component in exhaust gas based on said calibrated detection output,

wherein said NOx sensor is mounted downstream of a NOx occlusion catalyst and wherein said detection output is calibrated while an air-to-fuel ratio is temporarily set to a rich side for cleaning NOx occluded in said NOx occlusion catalyst.

59. (previously presented): A method for detecting the concentration of exhaust gas using a NOx sensor having a detection output which detects the concentration of a NOx component in a gas discharged from an internal combustion engine, the method comprising:

detecting the concentration of the NOx component in atmospheric air to obtain a zero point, which indicates a zero concentration of the NOx component,

calibrating the detection output of the NOx sensor based on said zero point, and

detecting the concentration of said NOx component in exhaust gas based on said calibrated detection output,

wherein said NOx sensor is mounted downstream of a NOx occlusion catalyst and wherein said detection output is calibrated while an air-to-fuel ratio is temporarily set to a rich side for cleaning NOx occluded in said NOx occlusion catalyst.

60. (previously presented): A method for detecting the NOx concentration of exhaust gas discharged from an internal combustion engine using a NOx sensor, the method comprising:

calibrating a detection output of the NOx sensor by determining a zero point, which indicates a zero concentration of NOx, based on a detection output of the NOx sensor in atmosphere, and

detecting the NOx concentration after the detection output has been calibrated,

wherein said NOx sensor has a first measurement chamber and a second measurement chamber, a first diffusion resistance unit and a second diffusion resistance unit, and a first oxygen ion pump cell and a second oxygen ion pump cell;

wherein said exhaust gas is diffused via said first diffusion resistance unit into said first measurement chamber, said first oxygen ion pump cell pumping out oxygen from said first measurement chamber so that oxygen in the gas diffused via said first diffusion resistance unit into said first measurement chamber will be of a specified oxygen concentration; and

wherein the gas having the specified oxygen concentration is diffused from said first measurement chamber via said second diffusion resistance unit into said second measurement chamber; NOx is decomposed in said second measurement chamber; said second oxygen ion pump cell pumping out dissociated oxygen ions; and the NOx concentration is detected from a current flowing in said second oxygen ion pump cell, and

wherein said NOx sensor is mounted downstream of a NOx occlusion catalyst and wherein said detection output is calibrated while an air-to-fuel ratio is temporarily set to a rich side for cleaning NOx occluded in said NOx occlusion catalyst.

61. (previously presented): The method as defined in claim 16, wherein said atmosphere is atmospheric air.

62. (previously presented): The method as defined in claim 17, wherein said atmosphere is atmospheric air.

63. (previously presented): The method as defined in claim 18, wherein said atmosphere is atmospheric air.

64. (previously presented): The method as defined in claim 22, wherein said atmosphere is atmospheric air.

65. (previously presented): The method as defined in claim 23, wherein said atmosphere is atmospheric air.

66. (new): A method for detecting the concentration of exhaust gas using a NOx sensor having first and second measurement chambers including associated first and second oxygen ion pump cells, respectively, which detects the concentration of NOx in a gas discharged from an internal combustion engine, the method comprising:

detecting oxygen concentration in a gas introduced into the first measurement chamber of the NOx sensor based on an electric current flowing through the first oxygen ion pump cell of the NOx sensor;

calibrating a detection output of the gas sensor by determining a zero point, which indicates a zero concentration of NOx, based on a detection output of the NOx sensor when the detected oxygen concentration assumes a value substantially the same as that in atmosphere, and

determining the NOx concentration after the detection output has been calibrated,

wherein said NOx sensor is mounted downstream of a NOx occlusion catalyst and wherein said zero point is calibrated based on a detection output of said NOx sensor when an air-to-fuel ratio is temporarily set to a rich side for cleaning NOx occluded in said NOx occlusion catalyst